Booster Pump Control and Pressure Sustaining Valve

Active Check Valve

- Isolates system from the effects of pump starts and stops for:
  - Solitary single speed pumps
  - Battery of single speed pumps (add & switch)
  - Battery of variable speed pumps (add)
- Pump overload and cavitation protection
- Controlled pipeline fill-up

The Model 743 Booster Pump Control & Pressure Sustaining Valve is a hydraulically operated, diaphragm actuated active check valve that opens or shuts off in response to electric signals. It isolates the pump from the system during pump starting and stopping, to prevent pipeline surges. While open, it sustains minimum discharge pressure regardless of fluctuating flow.

Features and Benefits

- **Line pressure driven**
  - Independent operation
  - No motor required
  - Long term drip tight sealing
- **Solenoid controlled**
  - Low power consumption
  - Low cost wiring
  - Wide ranges of pressures and voltages
  - Normally Open or Normally Closed
- **Check feature (spring loaded type)**
  - Replaces line sized check valve
  - Fail-safe mechanical closure
- **In-line serviceable** – Easy maintenance
- **Double chamber design**
  - Non-slam opening and closing characteristic
  - Protected diaphragm
- **Balanced seal disk** – High flow capacity

Major Additional Features

- Pump differential pressure sustaining – **743-06**
- Electronic control – **743-18**
- Pressure sustaining & Pressure reducing – **743-2Q**

See relevant BERMAD publications.

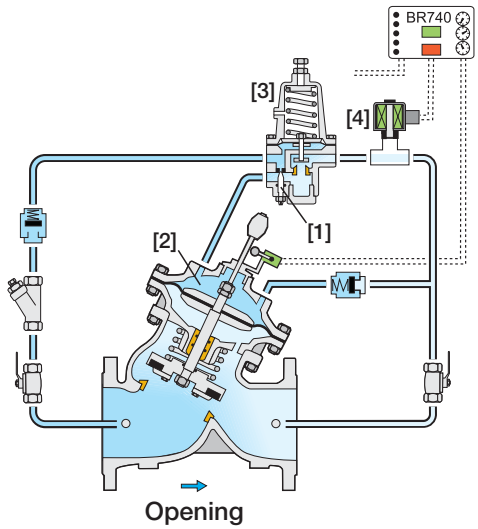
Sequence of Operation (Normally Open Type)

The Model 743 is a pilot controlled valve equipped with an adjustable, 2-Way, pressure sustaining pilot (optional with sealed spring cell), a 2-Way solenoid pilot (optional 3-Way), a limit switch and check valves. Two optional solenoid control circuits are available:

- 2-Way solenoid (see explanations & drawings below)
- 3-Way solenoid, controlling the pressure sustaining pilot sealed spring cell

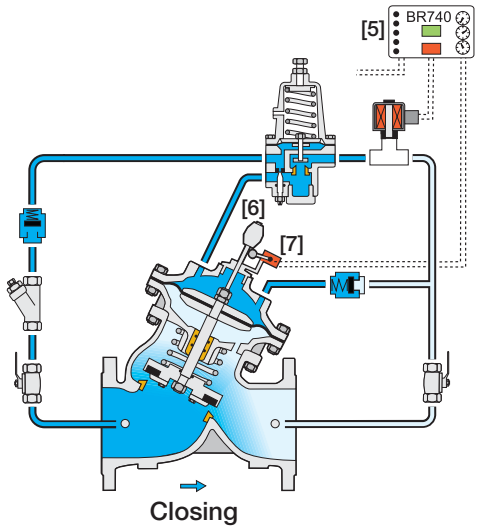
Pump Starting Procedure

The needle valve **[1]** continuously allows flow from the valve inlet into the upper contro chamber **[2]**. Prior to pump start, the valve is hydraulically closed although electrically open. As pump starts, valve upstream pressure builds and rises above the system static pressure, causing opening hydraulic forces to rise. The upper control chamber pressure is released to valve outlet through the pressure sustaining pilot **[3]** and the de-energized solenoid **[4]**, allowing the valve to gradually open. If as a result of valve opening, the discharge pressure drops to pilot setting, the pressure sustaining pilot throttles causing the main valve to throttle, and sustaining upstream pressure at pilot setting.



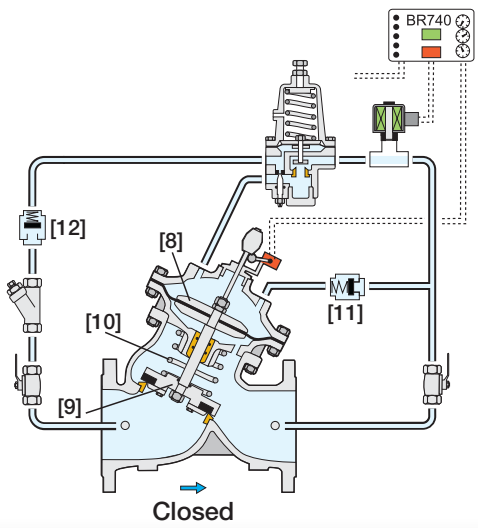
Pump Stopping Procedure

In pumping systems with standard check valves, the shut-down command is issued directly to the pump, abruptly shutting it down.
In systems with "active check valves", the shut-down command is issued to the BR740-E electronic controller **[5]** which energizes the solenoid. The solenoid then closes, stopping release of pressure from the upper control chamber, gradually closing the main valve. As the indictor collar **[6]** moves down, it activates the limit switch **[7]**, signaling the controller to shut down the pump.
After a preset time delay, the controller de-energizes the solenoid and resets the limit switch command, allowing the pump to start when next signaled.
The valve remains hydraulically closed and electrically open.



Power Failure - Spring Loaded, Zero Velocity Non-Return Valve

If electric power fails during pumping, the upstream pressure immediately drops causing the hydraulic forces acting on the diaphragm assembly **[8]** and closure **[9]** to balance. The spring **[10]** then breaks this balance, closing the valve before the flow can change direction. Once the main valve has closed, the check valve **[11]** allows downstream pressure into the upper control chamber while the check valve **[12]** traps it, resetting the main valve for the next pump starting process.



Typical Applications

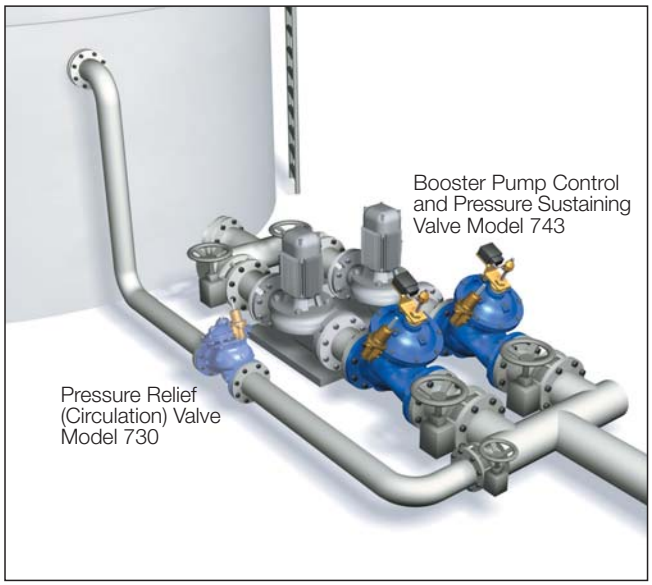
Network Over Demand

Network demand is greater than pump design specifications:

- During empty pipeline filling
- During over demand by consumers
- When the pump pressure specification is much higher than system resistance

Any of these factors might cause pump overload and cavitation damage.

The Model 743, by adding a pressure sustaining feature to the Booster Pump Control Valve, ensures that the pump operates within design specifications protecting both the pump and the system.



BR 740-E Electronic Controller

The BR 740-E coordinates between all system components to eliminate surges from the system. This controller provides built-in operating modes that can be selected on-site. These modes are based on accumulated know-how to prevent errors that might occur during on-site programming.

Engineer Specifications

The Pump Control & Pressure Sustaining Valve shall open or shut off in response to electric signals. It shall isolate the pump from the system during pump starting and stopping, to prevent pipeline surges. While open, it shall sustain minimum discharge pressure regardless of fluctuating flow.

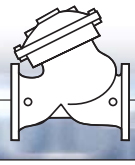
Main Valve: The main valve shall be a center guided, diaphragm actuated, globe valve of either oblique (Y) or angle pattern design. The body shall have a replaceable, raised, stainless steel seat ring. The valve shall have an unobstructed flow path, with no stem guides, bearings, or supporting ribs. The body and cover shall be ductile iron. All external bolts, nuts, and studs shall be Duplex® coated. All valve components shall be accessible and serviceable without removing the valve from the pipeline.

Actuator: The actuator assembly shall be double chambered with an inherent separating partition between the lower surface of the diaphragm and the main valve. The entire actuator assembly (seal disk to top cover) shall be removable from the valve as an integral unit. The stainless steel valve shaft shall be center guided by a bearing in the separating partition. The replaceable radial seal disk shall include a resilient seal and shall be capable of accepting a V-Port Throttling Plug by bolting.

Control System: The control system shall consist of a solenoid pilot, an adjustable, direct acting, 2-Way pressure sustaining pilot, two check valves (for 12" valves and larger, an additional check valve), a limit switch, two isolating cock valves, and a filter. All fittings shall be forged brass or stainless steel. The assembled valve shall be hydraulically tested.

Quality Assurance: The valve manufacturer shall be certified according to the ISO 9001 Quality Assurance Standard. The main valve shall be certified as a complete drinking water valve according to NSF, WRAS, and other recognized standards.

BERMAD Waterworks



700 Series

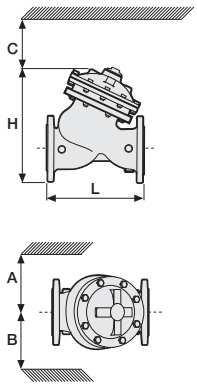
Model 743

Technical Data

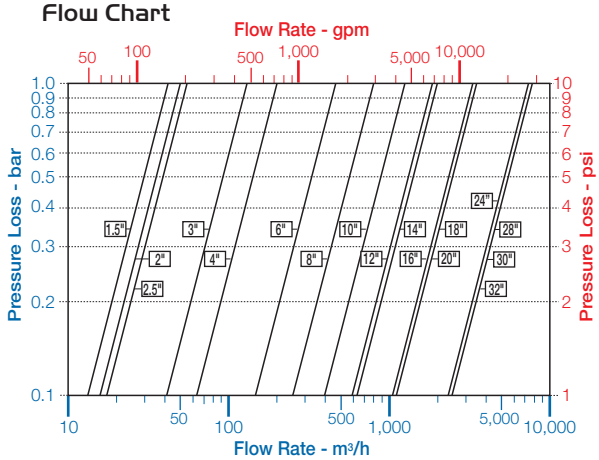
Dimensions and Weights

Size		A, B		C		L		H		Weight	
mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	kg	lbs
40	1½"	350	14	180	7	205	8.1	239	9.4	9.1	20
50	2	350	14	180	7	210	8.3	244	9.6	10.6	23
65	2½"	350	14	180	7	222	8.7	257	10.1	13	29
80	3"	370	15	230	9	250	9.8	305	12.0	22	49
100	4"	395	16	275	11	320	12.6	366	14.4	37	82
150	6"	430	17	385	15	415	16.3	492	19.4	75	165
200	8"	475	19	460	18	500	19.7	584	23.0	125	276
250	10"	520	21	580	23	605	23.8	724	28.5	217	478
300	12"	545	22	685	27	725	28.5	840	33.1	370	816
350	14"	545	22	685	27	733	28.9	866	34.1	381	840
400	16"	645	26	965	38	990	39.0	1108	43.6	846	1865
450	18"	645	26	965	38	1000	39.4	1127	44.4	945	2083
500	20"	645	26	965	38	1100	43.3	1167	45.9	962	2121

Data is for Y-pattern, flanged, PN16 valves
Weight is for PN16 basic valves
"C" enables removing the actuator in one unit
"L", ISO standard lengths available
For more dimensions and weights tables, refer to Engineering Section



Flow Chart



Data is for Y-pattern, flat disk valves
For more flow charts, refer to Engineering Section

Main Valve

Valve Patterns: "Y" (globe) & angle
Size Range: 1½–32" (40-800 mm)
End Connections (Pressure Ratings):
Flanged: ISO PN16, PN25 (ANSI Class 150, 300)
Threaded: BSP or NPT
Others: Available on request
Working Temperature:
Water up to 80°C (180°F)
Standard Materials:
Body & Actuator: Ductile Iron
Internals:
Stainless Steel, Bronze & coated Steel
Diaphragm:
NBR Nylon fabric-reinforced
Seals: NBR
Coating:
Fusion Bonded Epoxy, RAL 5005 (Blue)
NSF & WRAS approved or Electrostatic Polyester Powder, RAL 6017 (Green)

Control System

Standard Materials:
Accessories: Bronze, Brass, St.Steel & NBR
Tubing: Copper or Stainless Steel
Fittings: Forged Brass or Stainless Steel
Pilot Standard Materials:
Body: Brass, Bronze or Stainless Steel
Elastomers: NBR
Internals: Stainless Steel
Solenoid Standard Materials:
Body: Brass or Stainless Steel
Elastomers: NBR or FPM
Solenoid Electrical Data:
Voltages:
(ac): 24, 110-120, 220-240, (50-60 Hz)
(dc): 12, 24, 110, 220
Power Consumption:
(ac): 30 VA, inrush; 15 VA (8W), holding or 70 VA, inrush; 40 VA (17.1W), holding
(dc): 8-11.6W

Values might vary according to specific solenoid model
For pressure sustaining pilot valve selection table, refer to Model 730.

Solenoid Selection

Valve Pressure Rating	Solenoid Control Circuit			
	2-Way		3-Way	
	281	404	330	311
PN 16	■		■	
PN 25		■		■

BR 740-E Controller
Supply voltage: 110, 230 V(ac) 50/60 Hz
Power consumption: <8 VA
Solenoid circuit fuse: 2A (Internal)
Pump control circuit fuse: 1A (Internal)
Dimensions (DIN): 96 x 96 x 166 mm, 0.75 kg
Housing material: NORYL (DIN 43700)
Limit Switch
Switch type: SPDT
Electrical rating: 10A, type gI or gG
Enclosure rating: IP66

How to Order

Please specify the requested valve in the following sequence: (for more options, refer to Ordering Guide)

Sector	Size	Primary Feature	Additional Feature	Pattern	Body Material	End Connections	Coating	Voltage & Position	Tubing & Fittings	Additonal Attributes
WW	6"	743	00	Y	C	16	EB	4AO	CB	S

Sector: WW — Waterworks

Size: 6" — 1½ - 32"

Primary Feature: 743 — Booster Pump Control & Pressure Sustaining

Additional Feature: 00

No Additional Feature	00
Closing and Opening Speed Control	03
Differential Pressure Sustaining	06
Electronic Control	18
Pressure reducing feature	2Q

Multiple choices permitted

Pattern: Y

Oblique (up to 20")	Y
Angle (up to 18")	A
Globe (24-32" only)	G

Body Material: C

Ductile Iron Standard	C
Cast Steel	S
St. Steel 316	N
Nickel Alumin. Bronze	U

End Connections: 16

ISO-16	16
ISO-25	25
ANSI-150	A5
ANSI-300	A3
JIS-16	J6
JIS-20	J2

Coating: EB

Epoxy FB Blue	EB
Polyester Green	PG
Polyester Blue	PB
Uncoated	UC

Voltage & Position: 4AO

24VAC/50Hz - N.C.	4AC
24VAC/50Hz - N.O.	4AO
24VDC - N.C.	4DC
24VDC - N.O.	4DO
24VDC - L.P.	4DP
220VAC/50-60Hz N.C.	2AC
220VAC/50-60Hz N.O.	2AO

Tubing & Fittings: CB

Copper Tubing & Brass Fittings	CB
Plastic Tubing & Brass Fittings	PB
St. St. 316 Tubing & Fittings	NN

Additonal Attributes: S

V-Port Throttling Plug	V
Large Control Filter	F
Electric Limit Switch	S
3-Way Control Loop	X
Valve Position Transmitter	Q
St. St. 316 Control Accessories	N
St. St. 316 Internal Trim (Closure & Seat)	T
St. St. 316 Actuator Internal Assembly	D
Delrin Bearing	R
Viton Elastomers for Seals & Diaphragm	E
Pressure Gauge	6

Multiple choices permitted

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